Volume Title: Transportation Economics

Volume Author/Editor: Universities-National Bureau Committee for Economic Research

Volume Publisher: NBER

Volume ISBN: 0-87014-308-5

Volume URL: http://www.nber.org/books/univ65-2

Publication Date: 1965

Chapter Title: Transport Costs, Pricing, and Regulation

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Chapter URL: http://www.nber.org/chapters/c7050

Chapter pages in book: (p. 3 - 42)

Transport Costs, Pricing, and Regulation

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In approaching the interrelationships among costs, pricing, and regulation, it is assumed that our interest is in allocative efficiency. Regulation may be construed as a measure designed to bridge any gaps between private and public interests that might be occasioned by inappropriate price-cost relations stemming from managerial pricing policies. Such gaps may arise at either end of the pricing scale, or from rates that are inimicable to the public interest because they are too low as well as from those that are too high.

Relevant questions with respect to rate floors include the cost concepts that appropriately govern private and regulatory pricing policy in competitive situations and the way costs are employed in this crucial aspect of regulation. Since the primary downward pressures on rates are generally conceded to be attributable to the railroads, a special look at their pricing policies is in order. While specific patterns and applications may be changing as a result of new competitive pressures, discrimination remains the hallmark of rate systems. Although frequently inferred, it has certainly not been established through present regulatory tests that inappropriately high price-cost ratios are out of the question. Accordingly, our discussion will be concerned with the appropriate employment of costs by regulators in setting both the upper and lower pricing boundaries within which managerial discretion should be free to operate.

Costs and Pricing: Governing Cost Concepts

It may seem surprising that a matter so thoroughly explored in the literature of economics as the costs which are relevant for pricing should require further attention. But it is apparent from a review of recent literature on transportation economics that the matter is not so

straightforward as might be expected. There is no reason to be concerned about the wild and heated controversy over principles among affected partisan transportation interests. But there is evidence of intellectual disagreement among disinterested students of the transport pricing problem which extends to either or both the governing economic principles and their applicability to transport as a special case. Accordingly, it will be useful to review some recent views on the subject, both to illustrate the areas of disagreement and, hopefully, to rationalize the main points of contention.

The basic issue to which most other questions are subsidiary is whether competitive rates should be "predicated on" or "related to" some measure of incremental or marginal costs as a floor, or whether they should be formally tied to "full costs" through regulatory dicta. The latter contemplates a formal "accounting" assignment to specific services or classes of output of those cost elements which escape measurement under the marginal principle.

The most recent statement supporting the unique relevance of incremental costs as a pricing reference is that advanced by a panel of ten economists in the October 1962 issue of the *Journal of Business*.[1] Being a member of that group and, along with the others, a subscriber to the principles it advanced, I consider this article a useful starting point for the present discussion. It is essentially a restatement of orthodox principles generally accepted, at least in the abstract, by most economists, and can be summarized very briefly.

1. Railroads manifest a greater proportion of unallocable costs than is found in most industries. These unallocable components arise from both the high level of fixed costs and the significant elements of joint and common costs that characterize the industry.

2. Of vital importance for the argument and for further discussion is that, while fixity lapses into variability as the time dimension extends and sights are changed from short- to long-run considerations, a substantial proportion of rail costs remain fixed even over time spans far longer than are really relevant for any managerial or regulatory decisions. Since the cost fixities persist and the joint and common components are unaffected by the time dimension, the unallocability of costs is far more than a short-run phenomenon and untraceable

[1] William J. Baumol *et al.*, "The Role of Cost in the Minimum Pricing of Railroad Services," *The Journal of Business*, October 1962, pp. 1–10. The complete panel of authors includes William J. Baumol, Burton N. Behling, James C. Bonbright, Yale Brozen, Joel Dean, Ford K. Edwards, Calvin B. Hoover, Dudley F. Pegrum, Merrill J. Roberts, and Ernest W. Williams, Jr.

elements are extremely important even for relatively long-term considerations. This is far less true of truck and barge line costs.

3. The relevant cost reference for pricing decisions is marginal (or incremental) cost since this measure provides the test for the profitability of a pricing decision. In social terms, comparative marginal costs, which provide the economically valid measure of the value of resources used, offer the appropriate guide as to which agency is the most efficient alternative.

4. Coverage of the overheads created by the common and joint and the persistently fixed costs can only be achieved through "assignments" to specific services or classes of services that reflect market conditions and thus depend upon service demands. Rates higher than those thus dictated would restrict utilization of the fixed rail plant, artificially inflate shipper costs, and thus contribute to economic inefficiency.

5. Derivations of fully allocated costs through arbitrary assignment of the unallocable, as a means for recovering the overheads, is an economically invalid and pernicious device to measure comparative efficiency or to establish relative competitive prices for different modes.

But the lack of unanimity on these matters is manifest by some citations from other recent literature. One striking case is found in the so-called "Doyle Report" prepared for the Senate Committee on Interstate and Foreign Commerce.[2] This study concludes that, with some minor qualifications, rate changes which enhance departures from fully distributed costs are presumptively unreasonably related to costs.[3] Professor George Wilson in his recent volume of essays unequivocably prescribes that competitive rates should be based on the fully allocated costs of the low cost carrier, who would be identified by this measure.[4] Although clearly not accepted as a guide to their own policy recommendations, Professor Meyer and his associates indicate in their study that one of the historical purposes of minimum rate control was to prevent a carrier (or agency) with lower short-run marginal costs but higher average (or long-run marginal) cost from uneconomically usurping traffic from a competitor.[5] Although other

[2] *National Transportation Policy*, Preliminary Draft of a Report Prepared for the Committee on Interstate and Foreign Commerce, U.S. Senate, by the Special Study Group on Transportation Policies in the United States, Committee Print, 87th Congress, 1st Session, 1961.

[3] *Ibid.*, p. 444.

[4] George Wilson, *Essays on Some Unsettled Questions in the Economics of Transportation*, Bureau of Business Research, Indiana University, 1962, pp. 83–84.

[5] John R. Meyer, Merton J. Peck, John P. Stenason, and Charles Zwick, *The Economics of Competition in the Transportation Industries*, Harvard University Press, 1960, p. 249.

citations might be offered, these bring into focus the significant issues and are frequently cited by others to establish the intellectual respectability of the "full-cost doctrine" in transportation pricing policy. It will be noted that one of the main sources of difficulty is the persistent failure to deal realistically (in terms of relevance for public and private decision making) with the time horizons of cost variability.

The Doyle Report gives lip service to the economic attributes and virtues of long-run marginal costs:

> . . . The recommendation that long-run marginal costs be defined as the appropriate floor to competitive ratemaking is sound long-range policy and will provide a basis for achieving rate structures which reflect the true cost advantages of the diverse modes. . .[6]

But the Doyle Report's definitions of long-run marginal and long-run out-of-pocket costs, which are regarded as virtually synonymous, embrace some puzzling references. At first glance these appear to be simply matters of loose terminology but they color the use of the concepts and cloud some vital relationships. For example, long-run out-of-pocket cost gives due consideration "to all *fixed* and *indirect* costs which are incurred because of the extra unit of production."[7] While confusing, this usage might be harmless if it did not influence further thought about cost relations.

The vitiation of the important conceptual distinction between fully-distributed costs and long-run marginal (or out-of-pocket) costs spawned by the defective definitions begins in earnest with the observation that the fixed costs of the past may or may not be appropriately considered in evaluating "the true fixed costs of additional production." And "if, in fact, they are appropriate guides to fixed costs which are incurred in additional production, it makes little difference in practice whether one refers to fully-distributed costs or long-run marginal or long-run out-of-pocket costs."[8] It is then an easy step to the proposition that "suitable" long-run marginal costs include a return sufficient "to defray all appropriate fixed and indirect costs, thus insuring continued production."[9]

This view suggests that over the long run, all costs are variable, and that if full account is taken of investment requirements and the associated costs imposed by added traffic, all costs will be traceable and

[6] *National Transportation Policy*, p. 441.
[7] *Ibid.*, emphasis mine.
[8] *Ibid.*
[9] *Ibid.*

no arbitrary allocations will be required. But the "theoretically pure" long run (contemplating complete variability) is, in the railroad case, an abstraction completely devoid of practical significance. As is well known, large elements of rail plant are not reproduced over very long time periods, and other investment as well lags far behind output. Substantial elements of rail cost remain fixed over any period relevant for either management or regulatory decisions. The variability that would be required to identify empirically fully-distributed costs with long-run marginal costs would have to be based on calculations stretching out into such an indefinite future as to be meaningless, because of the unpredictability of technological change as well as other factors, such as demand shifts.

The "long-run" concept may be employed in another way which is far more meaningful for railroads—that is, as a time period adequate to permit full accommodation of the plant to any output changes which may be realized. In this meaning, investment levels may change and short-run fixed costs will vary, but it is not necessary to contemplate that *all* investment costs must have thus varied before a meaningful "long-run" calculation can be made. This is, of course, the conception of the "long-run" that is implicit in the cross-section analyses that undertake to measure cost variability. These analyses cover the wide range of outputs and traffic densities that characterize the nation's railroads and provide empirical support for the reality of "long-term" fixities. Precisely because they do cover such a wide range of densities these analyses tend, if anything, to understate the fixed components and to overstate the long-run marginal costs that are really relevant for economic decisions; accordingly, they represent a highly conservative technique. In their measurements of long-run marginal costs, Meyer and his associates identify costs totalling a "reasonably substantial sum" which "represent unallocable overhead costs in the best empirical meaning of that term." [10] Accordingly, any realistic measure of "long-run" marginal costs will not exhaust all costs to insure against bankruptcy, and uncovered overheads will have to be assigned either arbitrarily or on a demand basis. Furthermore, the untraceability attributable to common and joint costs will not be washed out regardless of the time horizon of cost measurements.

Failure to recognize this empirical distinction between fully distributed and long-run marginal costs is reflected in the final recommendations on cost and pricing of the Doyle Report. One prescription

[10] Meyer *et al.*, *Economics of Competition*, p. 49.

is that "rate changes which result in rates that depart further from fully distributed costs than at present, may be presumed to produce rates unreasonably related to costs, unless specific evidence can be presented to demonstrate that such rates are reasonably related to long-run marginal costs." [11] Except for changes in the prices of factor inputs, long-run marginal cost (as realistically defined) will be less than fully distributed costs. Unless a rate is already below marginal costs, any reduction will inevitably bring it more closely into line with that measure.

Wilson does not merely flirt with fully distributed cost as does the Doyle Report, but embraces it affectionately. He finds that "the most sensible policy would be to have the rates based upon the fully allocated costs of the low-cost carrier (that is, the carrier whose *fully* allocated cost is lowest) . . . ." [12] He is explicitly led to this espousal of fully distributed costs through the traditional rule that "in the long run all costs are variable and the fixed-cost category disappears." [13] But, unlike the Doyle Report, he does not argue from this to the practical identity of fully allocated and long-run marginal costs. Rather, he realistically recognizes the distinction between train-journeys as the basic output unit and tons or ton-miles as the sales unit; this creates indivisibilities for pricing purposes that persist over the long run. It is these indivisibilities that are arbitrarily prorated in his concept of fully distributed cost. He explicitly rejects what he defines as the usual meaning of fully distributed cost, which involves the allocation of short-run fixed costs, and presumes away any problem of allocating fixities in something greater than the short run.

The earlier comments regarding appropriate and realistic time horizons for the railroad case are applicable here and need not be repeated. However, the *pro rata* allocation of the indivisible variables requires a closer look. Wilson observes with respect to these indivisible costs that *pro rata* allocation is both simple and based on precedent[14]—attributes that are respectively questionable and irrelevant. These costs appear to be nothing more than members of the common and joint cost family which, as Wilson himself recognizes in another section of his volume, can only be recovered on a noncost (or demand) basis.[15]

He is, nevertheless, dubious about the cost allocating function of

[11] *National Transportation Policy*, p. 442.
[12] Wilson, *Some Unsettled Questions*, pp. 83–84.
[13] *Ibid.*, p. 81.
[14] *Ibid.*, p. 82.
[15] *Ibid.*, p. 77.

demand in competitive markets (although the endorsement mentioned is not apparently reserved for noncompetitive situations), arguing that there is "a 'critical' point in the operation of an enterprise with large elements of indirect or indivisible costs beyond which further applications of the marginal cost principle can only lead to economic loss; along with this is a corresponding withdrawal of capital or elimination of operations for which rates not much above directly traceable costs have been quoted." [16] It is not particularly helpful, however, to suggest that profit maximizing through demand pricing is acceptable for some portion of output, but that the bulk of sales must be made at prices above the best the market will permit.

This suggestion that competition in transportation is inherently ruinous is of doubtful validity.[17] But even if it is true, there is no particular reason for seizing on fully distributed cost as a pricing reference point, plagued as it is with such serious defects as arbitrariness and circular relationships with volume.[18] If Commission intervention is needed to prevent the ruinous gravitation of rates, other less objectionable standards are available, including, for example, some minimum markup above long-run out-of-pocket costs.

Despite his formal adherence to fully distributed cost as a competitive pricing guideline, Wilson fortunately does not allow it to intrude too seriously into his substantive policy recommendations. Indeed, he expresses great admiration for "value of service pricing," where the cost and quality of a rival's offerings are the key value measures. Much of this retreat is dictated by wholesome respect for the power of actual or potential private carriage as a market conditioner. It would appear that the fully distributed cost concept, however defined, is as flabby in practice as it is in principle.

Although cited only as an historical argument for minimum rate control and clearly not a reflection of the policy conclusions of the study, a passage in the work of the Meyer group has been loosely used as theoretical support for full-cost pricing. Accordingly, it offers a useful focus for a further consideration of some significant issues of

[16] *Ibid.*, p. 83.

[17] For one contrary set of arguments on this subject see Merrill J. Roberts, "The Regulation of Transport Price Competition," *Law and Contemporary Problems*, Autumn 1959, pp. 557–585.

[18] Wilson seems to get into somewhat the same box that the Doyle Report did with respect to the ambiguity in the measurement of fully distributed cost: "What the full cost criterion basically means is that rates in intercarrier competition should be based upon the average cost of *normal, anticipated* traffic volumes." Wilson, *Some Unsettled Questions*, p. 85 (emphasis mine).

competitive price regulation. This passage refers to regulatory policy which is designed to prevent the movement of traffic by a carrier with lower marginal but higher average costs than a rival.[19] Apparently this policy is concerned with the inefficiency of penalties if a highly transitory cost advantage is converted to higher resource costs.

The railroads characteristically introduce the anomaly of lower marginal but higher average costs than a competitor. But further consideration of comparative cost structures reveals that the marginal cost advantage of rails, predicated on the realistic "long-run" concept that full plant adjustment is made to output increases, is apt to be quite persistent. Marginal cost, it will be recalled, is not a component of total cost at a given output level, but the *addition to* total costs associated with increasing volume.[20] Social efficiency is, for example, concerned with a comparison of the added rail or truck costs that will result if a given block of output is carried by one mode or the other. Precise determinations of the added costs that might be expected in specific situations undoubtedly require close consideration of the layering and cycling of railroad investment. But appropriately designed cross-section analyses, extrapolating from the cost experience of other companies with higher output levels, provide a valid indicator of the investment requirements and the associated costs that can generally be expected from output increments. Such "long-run" marginal costs provide at least the basic foundation of rail cost measurements from which efficiency may be realistically determined. Cost measures exceeding this level reflect an artificial or contrived degree of variability and thus offer a poor test of comparative efficiency.

As the foregoing suggests, a number of efficiency penalties may be incurred by hewing too closely to the comparative average cost line. Since reproduction of much of the rail investment that is reflected in average costs is long deferred, while truck investment turnover is relatively rapid, it might be worthwhile to take advantage of the free capacity availability reflected in the lower marginal costs of rails. If one or two generations of truck investment (over, say, five to ten years) can be avoided, a clear social saving is realized regardless of longer term outcomes. In addition, increases in output levels may by themselves change the average cost relationships and put the railroad in the low-cost position by that standard as well. Furthermore, technological improvements may intervene to produce the same result. These

[19] Meyer *et al.*, *Economics of Competition*, p. 249.

[20] This is a reminder which Professor Samuelson felt compelled to offer in his *Foundations of Economic Analysis*, Cambridge, 1947, pp. 241–242.

considerations suggest the folly of excluding railroads from markets where they demonstrate lower long-run marginal costs, regardless of comparative average costs.

Although not so clear cut, the foregoing considerations are applicable in some degree to relatively short-run pricing situations, as well as to the "long-run" in which there is full plant adjustment to expanded output. The relevant pricing horizon for management is clearly determined by the duration of the expected revenue change. According to the panel statement:

> The decision is governed by such revenue dimensions as the nature and amount of the comtemplated change in volume, the length of the commitment to carry the traffic, the duration and geographic scope of the changed rate, the alterations of the service that might require added investments, and the time period in which changes may legally or practically take place.[21]

Accordingly, profit considerations may dictate a strictly short-run view of costs. This is clearly true if the pricing decision involves a temporary rate (such as one covering the movement of material to a construction project), but extends also to the general case where fuller plant utilization requires a consideration of short-run demand characteristics. There are good reasons to presume that pricing based on short-run marginal costs is not only profitable but is also consistent with efficient resource allocation, particularly since the railroad short run corresponds closely with the long run of a truck competitor. If rail prices predicated on a short-run cost reference are all the market will allow, replacement of the assets required to produce the service involved will be neither socially economic nor privately profitable, dictating substitute investment in an alternative mode. In the meantime, the economy will have enjoyed the use of the available capacity. However, economies realized from fuller utilization of available facilities must be weighed against the costs associated with such possible short-run dislocations as the elimination of firms with greater long-run efficiency. Accordingly, some "compromise" restrictions on strictly short-run pricing by railroads in competitive situations may be a required function of regulation.

As these considerations imply, maximizing returns with rates above marginal costs and below full costs does not occasion a reduction of investment below some socially desirable level. Full cost pricing, which necessarily reflects past investment costs which are unrelated to facility use, does not supply valid investment guidance. Enforcing

[21] Baumol *et al.*, in *The Journal of Business*, October 1962, p. 3.

this pricing policy where such costs are higher than "maximizing" prices (the relevant and interesting regulatory case) will in itself impose artificial restrictions on future investment levels. Sensible management and public policy requires prices that will permit the assets employed to earn as much as the market will allow. Whether the replacement ultimately occurs depends upon the fruitfulness of the maximizing goal, with the decision necessarily made at replacement time. Such a process can be socially objectionable only if the earnings are excessive. The stifling of marginal costs—particularly those associated with reasonably long-term horizons that reflect the investment requirements of traffic increments—cannot serve the public interest.

Market-Oriented Rates and Distribution Efficiency

Despite the established relevance of marginal costs as a measure of comparative efficiency and as a price floor, a system of market-oriented rates predicated on profit maximizing may still be open to question. There may be concern, for example, about unduly high charges in inelastic markets, or excessive discrimination (which is discussed in a later section). But the pricing system contemplated must also pass muster in other important respects, particularly on the validity of the resulting intermodal traffic allocation. The question is whether intermodal price relations may be expected to square with relevant cost relations when prices are designed to maximize contributions above incremental costs. This discussion is independent of the contention that this goal will produce a disorderly gravitation of rates to "ruinous" levels. It may be assumed either that such ruinous pricing is not to be expected or that regulation will prevent it.

Where the services of the various agencies in a given market are homogeneous, carrier demand functions are identical and in the maximizing process the carrier with the lower marginal cost presumably can (and will) generate the lower price. As a result, shippers will generally select the low-cost mode to achieve both private and social efficiency. Such service-quality homogeneity is certainly not unknown in some market situations. In others, shippers' requirements may make them indifferent to qualitative differences. In either case, traffic allocations are sensitive only to lower rates predicated on lower costs.

But it is more probable that such homogeneity or shipper indifference is a special case. Where qualitative differences enter into shippers' calculations, it is important to recognize the rather obvious (but occasionally overlooked) proposition that efficient traffic allocations are

not determined exclusively by comparative transport (movement) costs, but must also take account of the different level of nontransport distribution costs associated with the employment of alternative agencies. As a result of these quality disparities, the simple proposition that low movement costs are determinative is inapplicable.

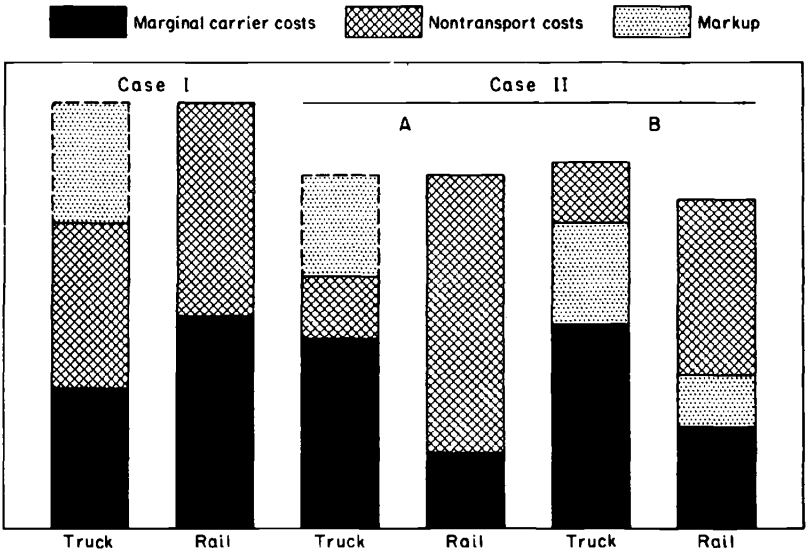
According to this reckoning, the most efficient carrier is the one offering the lowest sum of transport costs (measured by *MC*) and nontransport distribution costs associated with its employment (*NTC*). Employing the rail-truck illustration, distribution efficiency is determined by a comparison of $MC_r + NTC_r$ and $MC_t + NTC_t$. Shippers, however, are swayed by the comparative prices (*P*) and not carrier costs, requiring a consideration of $P - MC$ margins, or "markup" (*MU*). Accordingly, distribution efficiency requires that where (for example) $MC_r + NTC_r$ exceeds $MC_t + NTC_t$, then $P_r + NTC_r$ must exceed $P_t + NTC_t$. In other words, the concern is whether rates which would be established under a market-oriented pricing system would divert traffic from the alternative agency offering the lower total distribution cost ($MC + NTC$). Serious consideration of this question offers scope for a major inquiry, but it is useful to give some attention to it even in a preliminary and tentative way.

It is simplest to proceed by assuming at the outset an "all or nothing" situation, where all available traffic in the market will be allocated to one or the other of the rivals depending on comparative distribution costs. This condition would be realized if there were only one shipper in the market or if all shippers had identical distribution requirements and thus qualitative evaluations. The governing relationships are illustrated in Figure 1.

In case I, one agency has both lower *MC* and lower *NTC*, and in II, one has lower *MC* but higher *NTC*. The shipper in case I will employ trucks so long as the "markup" does not produce a rate which makes the cost of rail distribution less. In a system of market-oriented prices, there is no reason to expect a rate to be established at that level. In this case, the traffic moves by the carrier affording both the lower marginal cost and the lower distribution costs. The indicated truck rate appropriately attracts the traffic to the more efficient system.

In case II A, rail enjoys lower marginal cost but truck affords lower distribution cost. The indicated rate limits are the same as above. In this case, however, in the interest of over-all efficiency, traffic moves by the carrier with the higher *MC*. Case II B illustrates another important point: if the relative prices were governed by a rule requiring each competitor to observe the same P/MC ratio, the traffic would be

Figure 1



forced to the agency occasioning the higher distribution cost at a sacrifice of over-all efficiency.

Alternatively formulated, a carrier's maximum markup, and therefore price (e.g., the railroad's), is established by:

$$\text{Max. } MU_r = (MC_t - MC_r) + (NTC_t - NTC_r) + MU_t$$

Introducing illustrative values:

$$\text{Max. } MU_r = (.60 - .20) + (.40 - .60) + .20 = .40.$$

In this case, a markup of less than 40 cents (35 cents) will attract the traffic to the railroad. The following price-cost relations will prevail:

$$\begin{aligned} MC_r + NTC_r &= \$0.80 \\ MC_t + NTC_t &= 1.00 \\ P_r + NTC_r &= 1.15 \\ P_t + NTC_t &= 1.20 \end{aligned}$$

In this circumstance, which appears to be a general case under the "all or nothing" assumption, the competitive price system operates to channel traffic to the agency affording the lowest real distribution costs.

The "all or nothing" limitation may be relaxed by assuming a number of shippers in the market with varying distribution system requirements and hence qualitative evaluations. This necessitates consideration of different shipper reactions to given rate relations. Thus, instead of

a single *NTC* for each agency, there will be a variety of them, depending on the specific distribution requirements. At any given price, shippers will compare $P + NTC$ and select the mode which minimizes their distribution costs. If they are rank-ordered according to the *NTC* associated with (for example) rail movements, they will be successively attracted to rail service by progressively lower rates (assuming, as in the traditional demand function, that the price of the substitute truck service remains unchanged). They will come over to rail, in other words, when for them $P_r + NTC_r$ is less than $P_t + NTC_t$.

In establishing "maximizing" rates, the competitors will be confronted with comparative costs (*MC*) and *NTC* measurements. Prices will be set at a point where the $P + NTC$ values attract the traffic volume which will maximize net revenues. The carrier with the generally lower set of $MC + NTC$ values will, in a sense, "control" the market as in the previous case. Accordingly, the "all or nothing" situation previously postulated appears to be representative of discrete points along a demand function. It can be roughly equated with a "consensus" or a weighted average of the comparative *NTC* measures of shippers with varying distribution requirements. In this case, competitive considerations will sufficiently restrain the $P - MC$ ratio of the carrier with the lower range of $MC + NTC$ combinations in a specific market to prevent a higher $P + NTC$ combination. The result is thus the same as was indicated for the "all or nothing" market, and the price relations described there may be regarded as representative of a specific maximizing price.

The situation here is complicated by the variety of shipper reactions to specific price relationships. If prices are set as in the foregoing illustration ($P_r = 55$ and $P_t = 80$ cents) some traffic will be shipped by each alternative, depending on particular *NTC* measures. Although higher or lower *NTC* values will appear identically in both the measures of shipper distribution costs ($P + NTC$) and of real costs ($MC + NTC$), a simple illustration reveals that the variation in these values can occasion price-cost relations inimical to efficient distribution. With the former *NTC* values ($r = .60$, $t = .40$) rail transportation was most efficient and, under the resulting comparative rates, also represented the shipper's choice. But for a shipper with higher NTC_r (70 cents) and lower NTC_t (35 cents) measures, the efficiency results are quite different with the same set of prices. The following relationships emerge in this case:

$$P_r + NTC_r = \$1.25 \qquad MC_r + NTC_r = \$.90$$
$$P_t + NTC_t = 1.10 \qquad MC_t + NTC_t = .95$$

Here truck transport offers lower distribution costs to the shipper, but higher real costs. It appears that variations in shipper distribution requirements in the face of a single market price (and price relationship) may indeed defeat efficiency as measured by the criterion employed.

As the foregoing illustration suggests, this anomaly arises where the intercarrier *NTC* differences are large in terms of marginal transport cost differences. It can arise predominantly from one direction—that is, where the services of the carrier with the low marginal cost are "undervalued" by some shippers in terms of the concensus value upon which the rate was predicated. It might be inferred from this that efficiency departures are most apt to be associated with truck movements of traffic where rail offers the lowest real distribution costs. If, however, the maximizing prices represent a consensus or weighted average, the probability is good that most traffic allocations will pass the efficiency test. In this case, there is reason for hoping that market-oriented rates built on the foregoing model will do a reasonably adequate job of preserving and fostering distribution efficiency.

Full evaluation requires, however, some consideration of how closely the model represents the real world. Although it probably reflects what enlightened shippers and carriers do or should try to do, it clearly contemplates perfect and unattainable knowledge on the part of both, including (as a particular difficulty) carrier measurements of *NTC*. This is perhaps not really serious and is certainly no indictment of market-oriented transport prices, since perfection of knowledge and measurements is not achieved in the economy generally. But it is apparent that rational carrier pricing requires intimate understanding of shipper distribution systems. It is equally clear that distribution efficiency depends at least as much on rational shipper purchasing decisions as it does on carrier pricing policy.

Costs and Minimum Rate Regulation

The ICC's distrust of marginal costs (or the "long-run out-of-pocket costs" generated by its staff) as a comparative efficiency measure is well documented.[22] It is necessary only to emphasize that the Commission is wed to the proposition that the competitor with the lower full costs is the more efficient and that his costs should set the floor under competitive rate adjustments. The governing viewpoint has frequently been characterized by this quotation from Commissioner Freas:[23]

[22] See, for example, Roberts, in *Law and Contemporary Problems*, Autumn 1959, pp. 560–561.

[23] *Rate-Making Rule*, Hearings before the Senate Committee on Interstate and Foreign Commerce on S. 3778, 85th Congress, 2nd Session, 1958, p. 172.

In many instances, however, the full costs of the low-cost form of transportation exceed the out-of-pocket costs of another. If, then, we are required to accept the rates of the high-cost carrier merely because they exceed its out-of-pocket costs, we see no way of preserving the inherent advantages of the low-cost carrier.

According to the principles enunciated earlier, the general result of this policy is apt to be a misallocation of traffic and presumably of investment, where, as is usually the case, long-run, out-of-pocket cost measures are involved.

It might be noted additionally that these cost doctrines are apparently becoming more thoroughly solidified through the processes of judicial review. In a recent appeal from a Commission decision, a Federal District Court took occasion to elaborate on the cost considerations governing competitive rate determinations under regulation.[24] This Court uncritically accepted the assumed identity between "long-run" and "fully-distributed" costs, reflecting the common failure to gear cost generalizations to the cost situations of particular agencies. Accordingly, it found that "the inherent advantages of lower cost refers to the long-run or fully-distributed costs of carriage." [25] By the same token, out-of-pocket costs are regarded as being identified necessarily with the short run. The Court is, therefore, concerned that "rates set by reference to out-of-pocket cost may favor what in the long run is the less efficient, higher cost mode."[26]

These pronouncements reflect the failure to recognize some of the distinctions pointed out in this discussion, particularly that in the railroad case incremental costs can have a long-run meaning that clearly differentiates them conceptually and empirically from fully-distributed costs. As previously argued, preventing a carrier with a strictly transitory short-run cost advantage from taking traffic from a competitor with lower long-run costs may represent an economically valid exercise of regulatory authority. But because of its confused long- and short-run

[24] U.S. District Court, District of Connecticut, *The New York, New Haven and Hartford Railroad Company v. United States and Interstate Commerce Commission*, Civil Action No. 8679 (1961) (Mimeo).

[25] *Ibid.*, p. 10.

[26] *Ibid.* In a decision on review, rendered after the completion of this paper, the U.S. Supreme Court overturned some of the District Court's opinions, but not those pertaining to the role and interpretation of costs. It observed that: "It is not for us . . . to decide in advance precisely how either carrier's inherent advantage should be measured or protected." But the Court continued with a further observation of some possible future significance: "It may be, for example, that neither a comparison of 'out-of-pocket' nor a comparison of 'fully-distributed' costs, as those terms are defined by the Commission, is the appropriate method of deciding which of two competing modes has the cost advantage on a given movement." Cited in *Traffic World*, April 27, 1963, p. 134.

identifications, the Court fails to realize that achieving this objective does not require the adoption of "fully-distributed" costs as a railroad rate floor. It is clear that greater economic understanding must be introduced into the processes of regulation if viable rate relations are to be fostered and permitted.

In supporting its application for reductions in grain rates, the Southern Railway introduced an abundance of economic evidence designed to clarify the crucial cost concepts and relations that have been examined. While the reduced rates were authorized by Division 2 over barge line protests, there is no evidence that this is attributable to any change in the Commission's thinking regarding the governing role of fully-distributed costs in competititive situations.[27] Rather, it effectively dodged the question of relevant cost references for intermodal competition by introducing a novel notion for such proceedings. It found that the uncompensated costs for publicly provided waterway (and presumably highway) facilities should be included in cost comparisons designed to identify the most efficient carrier. Although Southern introduced some measurements, the Commission found them of questionable accuracy. Not having definitive measurements of these public costs, it concluded that it was unable to reach a decision regarding "inherent advantages" and, since the rates were "compensatory," permitted them to become effective.

This aspect of the case is consistent with past policy. The Commission is quite willing to accept out-of-pocket cost evidence in testing whether proposed rates are compensatory. Such a showing will often suffice unless the record of a case shows that, although compensatory as thus measured, the proposed rates are designed to attract traffic for a more "efficient" competitor—that is, one with lower full costs.

A recent classic illustration is found in the decision in *Coal—Southern Mines to Tampa and Sutton, Florida*, where the Commission authorized the reduced rates, finding that they were compensatory in terms of out-of-pocket cost coverage.[28] It is noteworthy that the traffic was moving by private water transportation and beyond the reach of the protesting barge lines, regardless of the rail rate. It seems clear that the rates would not otherwise have been approved.

Some additional insights regarding the role of costs in competitive rate regulation are provided by a survey of 350 Commission decisions

[27] Cited in *Traffic World*, January 26, 1963, pp. 11–14. Approval was subsequently denied by the full Commission in an opinion handed down after this paper was completed. This reversal, however, provides no significant new insights regarding the role of costs in such litigation.

[28] I. & S. Docket No. 7179, October 1, 1962 (Mimeo).

in rate reduction cases decided between March 14, 1960, and May 25, 1962.[29] Formal cost evidence was introduced in 252, or 80 per cent, of the cases surveyed. Costs were introduced exclusively by the proponents in 95 cases and by the protestants in 69, but both offered such showings in most situations.

In terms of competitive relations, the bulk of the cases (319) fall into three classes: truck intramodal (152); intermodal, with truck proponents and rail protestants (112); and intermodal, with the role of the parties reversed (38). The relatively small representation of cases involving rail reductions with motor carrier protests is noteworthy. Cost evidence is more prominent in intermodal than in intramodal cases, appearing in 90 per cent of the former (165 of 185 cases) but in only 71 per cent of the latter (117 of 165). These percentages varied significantly, however, with the participating agencies. Of the 152 truck intramodal cases, costs were introduced in only 72 per cent. But the ratio rose to 88 per cent in cases involving truck proponents and rail protestants and jumped further to 95 per cent when the roles of the parties were reversed. It is also noteworthy that motor carriers are less prone to rely on cost evidence than the railroads. In rail rate cases, motor carrier protestants supplied cost evidence in 55 per cent of the cases; but in truck rate cases, the railroads used cost evidence in 80 per cent.

Surprisingly, in only 8 of the 252 cases did the cost evidence pertain to fully-distributed costs. Out-of-pocket measures were involved in 219 cases, while in the others the report did not specify, possibly because of the vagaries of the presentations. This suggests that the limitations imposed by fully-distributed costs may not be as pervasive as one might be led to believe. While it plays a great part in some important cases, it does not seem to intrude routinely into competitive rate adjustments.

For the cases as a whole the denial rate was quite high (70 per cent), with little difference based on whether or not cost evidence was involved. The comparative figures were 68 and 72 per cent. But in the cases invoking this evidence, cost reasons were very important for the denials, either because the rates were found to be noncompensatory or because the cost evidence was inadequate to support the case. Such factors were instrumental in 144 of the 192 denials, or 80 per cent. It is not surprising that the denial rate is lower where only the proponent submits cost evidence. This obtained in 59 of 93 cases, for a 63 per cent rate. Similarly, where the protestants only supplied such evidence (69 cases), denials rose to 78 per cent. A correlation analysis confirmed the validity of the foregoing percentage relationships.

[29] Covering volumes 309–316.

These comparisons suggest some rather interesting and perhaps surprising propositions. The great majority of cases involved reductions in motor rather than rail rates. This balance, which prevails for intermodal as well as for intramodal relationships, undoubtedly reflects the greater competitiveness of the trucking industry. But it certainly indicates that, despite their restiveness, the railroads are not above invoking the protective cloak of regulation. Cost evidence figures prominently in these proceedings and denials are generally related to cost considerations. However, the evidence is predominately related to out-of-pocket and not full-cost measurements. Since the main denial basis is failure to establish the compensatory character of the proposed rates (as measured by out-of-pocket costs), it appears that the restrictions on pricing freedom imposed by full-cost tests do not characterize the litigation. These restrictions may, however, be relatively more important when measured in terms of associated traffic volumes, a criterion which could not be tested in this survey.

The Effectiveness of Railway Rate Policy

It has been alleged that railroad pricing in markets involving intermodal competition has been inept, bringing distress not only to competitors but to the railroads themselves. This point was emphasized in a paper delivered recently by a barge line official who based his contentions on personal experiences.[30] In more general terms, it is argued by their competitors that railroads keep reducing rates and get worse off financially year after year, with the clear implication that rate reductions are at fault. If true, such allegations suggest either irrational decision processes or a hopeless pricing situation. Whatever the cause, such contentions must be of interest to students of transportation pricing policy. The fruits of any consistent default of responsibility are apt to be uneconomic price relationships and transport investment levels, while the prospect of a continued drying-up of railroad revenues is also a cause for concern. As the acknowledged price leaders in the transport sector, railroads must pursue rational pricing goals and act with reasonably adequate information inputs if competitive stability

[30] Noble C. Parsonage, "Costs, Pricing and Discrimination," delivered at the annual meetings of the American Transportation Research Forum, Pittsburgh, Pa., December 27, 1962. In Mr. Parsonage's words: "I have actually participated in a case where the facts have shown that if the entire volume of the movement divided between water and rail were to move all rail at the proposed reduced rates, it would generate less gross revenue to the railroads than was being realized on the volume handled at the higher rail rates" (p. 1).

is to be achieved without the heavy hand of regulation.[31] For example, if railroad price makers are unduly fascinated by volume at the expense of profits, the results may indeed be unfavorable for themselves as well as for their competitors and even for the economy generally.

A detailed case-by-case evaluation of the results of railroad pricing policy is well beyond the scope of this undertaking. But the problem is of sufficient importance to warrant even generalized analysis in the hope that some tentative conclusions may be reached.

The rate indexes published annually by the I.C.C. indicate, for all commodities combined, an increase from 108 to 121 between 1954 and 1958 and a steady decline thereafter to 114 in 1961 (1950 = 100).[32] The indexes for the 60 major commodities and commodity classes which are computed individually conform generally to this same pattern, but with rather substantial variations in the rates of change. For example, between 1958 and 1961 the rate index for industrial sand declined from 128 to 127, while for automobiles it shot down 44 points from 122 to 78.

The following analysis attempts to evaluate the profitability of the pricing actions underlying these index movements, with particular reference to the reductions. It is based on interrelationships for the 1957–1960 period between the rate indexes and changes for each of the commodities in rail tonnage carried, total market size (production less local consumption), railroad market share, and railroad revenues.[33]

In over-all terms, the rate reductions have been modest and not particularly fruitful. The general results for all commodities combined are indicated for two periods in the following table.

	Percentage Change in				
Period	Rate Level	Tons Carried	Adjusted Production	Revenues	Ratio of Rail Tons to Adjusted Production
1958–59	−2.5	+3.7	+6.4	+3.3	−2.7
1959–60	−1.8	+1.0	+2.8	−3.1	−2.0

The rather small rate reduction of 2.5 per cent between 1958 and 1959 was accompanied by a 3.7 per cent increase in tonnage carried and a nearly comparable advance in revenues. However, adjusted production of all commodities (net of local consumption and thus

[31] For more detail on this rather obvious proposition, see Roberts, in *Law and Contemporary Problems*, Autumn 1959, pp. 570–78.

[32] I.C.C., Bureau of Transport Economics, *Indexes of Average Freight Rates on Railroad Carload Traffic*, 1953–1961 (Statement RI-1, 1963).

[33] From I.C.C., Bureau of Transport Economics and Statistics, *Fluctuations in Railroad Tonnage Compared with Production, Class I Line-Haul Railroads, 1958, 1959, and 1960*, Statement No. 6301 (1963).

representing the size of the aggregate market) jumped by 6.4 per cent, occasioning a decline in the railroads' market share. Thus, even with the reduction railroads were unable to get a proportionate share of the new volume. The 1959–60 story was about the same except that total revenue also declined.

More interesting than these gross figures, however, are some details for the sixty specific commodities or commodity classes for which rate indexes are separately computed. Table 1, which takes account of the 1957–58, 1958–59, and 1959–60 price changes, shows the results for each. Increases predominated in the 1957–58 period; rate indexes for forty-nine classes went up, compared with only six reductions and five cases of no change. At the same time, revenues increased for sixteen classes and declined for the other forty-four. In the other two periods, however, decreases predominated, representing forty-seven of the cases in 1958–59 and fifty-five in 1959–60. In these two periods revenues declined in twenty and forty-three of the cases, respectively.

Because of demand shifts induced by changed market size and other factors, the foregoing comparisons have little to say about railroad service demand elasticity. Where market size expands (for nonprice reasons), the total revenue figures overstate the true effect of the price change as such, while the reverse is true for shrunken markets. Deeper probing is thus provided by factoring the total revenue change into its components in order to isolate and subtract the portion attributable to the changed market size.[34]

Since most markets expanded, the revenue effect net of shifts in market size are generally less favorable than when total revenue change is measured. The direction of the adjusted revenue changes are shown by commodities for each period in Table 1, with the results summarized below.

PRICING MOVEMENT	Three-Period Total	REVENUE INCREMENT							
		1957–58		*1958–59*		*1959–60*		*Total*	
		Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative
Increases	58	13	36	4	2	1	2	18	40
No change	15	1	4	1	6	1	2	3	12
Decreases	107	0	6	7	40	7	47	14	93
Total	180	14	46	12	48	9	51	35	145

[34] Revenue changes attributable to the various influences were derived as follows:
1. Price change: price change (per cent) × R_1 (first period revenue).
2. Change in market size: per cent change in adjusted production × R_1.
3. Change in tons carried: per cent change in tons × R_1.
4. Price acting on tons carried: (3) − (2).
5. Interaction of market size and price change: price change (per cent) × (2).
6. Interaction of tons carried and price change: price change (per cent) × (4).
7. Combined effects: sum of (1) + (4) + (6) + (7).
8. Price change plus unmeasured influences: (8) − (2).

TABLE 1

RELATIONSHIP BETWEEN RATE CHANGES AND REVENUES FOR SIXTY COMMODITY CLASSES, 1957-60

	1957-58			1958-59			1959-60			
	A	B	C	A	B	C	A	B	C	D
Wheat	+4.1	+14.3	Neg.	+0.8	-4.4	Pos.	-2.4	+6.0	Neg.	196
Corn	0.0	-0.7	Neg.	-12.9	-19.5	Neg.	-4.5	-8.4	Neg.	142
Cotton in bales	+3.8	+0.8	Neg.	-0.9	+12.6	Neg.	-1.9	-10.8	Neg.	152
Potatoes, other than sweet	-1.7	-0.8	Neg.	-6.8	-3.4	Pos.	-0.9	-6.4	Neg.	84
Sugar beets	+5.8	+7.1	Pos.	0.0	+0.7	Neg.	-2.1	+1.3	Pos.	59
Prods of agric., NOS	+3.3	-11.5	Pos.	-3.2	+2.9	Neg.	-6.7	-0.5	Neg.	104
Cattle and calves, S.D.[a]	+4.7	-4.8	Neg.	-1.5	-8.0	Neg.	-2.3	-12.1	Neg.	79
Meats, fresh, NOS	-4.8	-11.4	Neg.	-0.8	+3.4	Neg.	-0.8	-3.2	Neg.	109
Anthracite coal, NOS	+1.8	-25.5	Neg.	-2.6	-11.3	Neg.	-0.9	-14.8	Neg.	120
Bituminous coal	+1.8	-17.2	Neg.	-1.8	-3.7	Neg.	-0.9	-2.3	Neg.	110
Coke	+4.4	-29.5	Neg.	0.0	+31.3	Pos	-0.8	+0.3	Neg.	103
Iron ore	+10.4	-31.2	Pos.	0.0	-7.1	Neg.	0.0	+32.5	Pos.	114
Clay and bentonite	+5.4	-3.8	Pos.	0.0	+11.4	Neg.	-2.2	-4.5	Neg.	151
Sand, industrial	+5.8	-11.8	Pos.	0.0	+23.2	Neg.	-0.8	-5.9	Pos.	124
Gravel and sand, NOS	+1.7	-3.5	Neg.	-1.7	+7.0	Neg.	-1.7	-13.0	Neg.	76
Stone and rock: broken, ground and crushed	+0.9	+3.1	Neg.	-1.7	-0.2	Neg.	-0.9	-8.6	Neg.	87
Fluxing stone and raw dolomite	+5.4	-24.1	Pos.	+2.2	+14.8	Pos.	+0.7	+2.4	Neg.	93
Asphalt	+4.3	-0.8	Neg.	0.0	-11.2	Neg.	-4.9	-9.4	Neg.	130
Salt	+5.4	-4.5	Neg.	-2.5	+1.2	Neg.	-0.9	+0.4	Neg.	134
Phosphate rock	-4.5	-2.0	Neg.	-5.7	+5.5	Neg.	-5.0	-3.2	Neg.	99
Products of mines, NOS	+4.0	-8.6	Neg.	0.0	+9.7	Neg.	-1.6	-5.9	Pos.	131
Logs, butts, and bolts	+10.4	-11.4	Neg.	+4.3	+13.7	Pos.	0.0	-6.9	Neg.	65
Posts, poles, and piling: wooden	+0.8	-10.6	Neg.	-7.9	+3.0	Neg.	-2.6	-6.3	Neg.	123
Pulpwood	+0.8	-4.7	Pos.	+0.8	+2.9	Neg.	+1.7	+5.0	Pos.	75
Lumber, shingles, and lath	+2.4	-1.8	Neg.	-2.4	+8.6	Neg.	-0.8	-12.5	Neg.	136
Products of forests, NOS	+6.0	-2.3	Neg.	-2.1	+12.1	Neg.	-2.2	-12.1	Neg.	109

(continued

TABLE 1 (continued)

	1957-58			1958-59			1959-60			
	A	B	C	A	B	C	A	B	C	D
Gasoline	0.0	-10.2	Neg.	-1.9	-2.9	Neg.	-6.7	-13.1	Neg.	93
Fuel: road and petroleum, residual oils, NOS	+3.6	-15.8	Neg.	-0.9	-4.6	Neg.	-1.8	-15.8	Neg.	104
Lubricating oils and greases	+3.2	-8.2	Pos.	-1.6	+4.3	Neg.	-3.9	-6.1	Neg.	123
Petroleum products, refined	+1.6	-3.6	Neg.	-7.9	-3.0	Neg.	-3.4	-3.1	Neg.	96
Chemicals, NOS	+3.2	-9.5	Neg.	-2.3	+10.1	Neg.	-2.4	-7.3	Neg.	179
Sodium (soda) products	+2.6	-4.2	Neg.	-5.0	+6.2	Neg.	0.0	-4.1	Neg.	173
Fertilizers, NOS	+1.7	+3.9	Neg.	-5.0	+3.8	Neg.	-3.5	-1.3	Neg.	145
Iron, pig	+8.8	-38.9	Neg.	-0.7	+36.0	Pos.	-1.5	-26.2	Neg.	187
Iron and steel: billet, bloom, and ingot	+1.6	-40.8	Neg.	-1.6	+72.4	Pos.	-2.4	-24.1	Neg.	155
Iron and steel: bar, rod, and slab	+8.5	-30.6	Neg.	+4.7	+21.3	Pos.	-6.7	+5.3	Neg.	184
Mfg. iron and steel	+1.8	-30.1	Neg.	-1.7	+12.8	Neg.	-3.5	+1.1	Neg.	193
Iron and steel pipe and fittings, NOS	+3.6	-45.1	Neg.	-3.5	+16.1	Neg.	-1.8	-10.1	Neg.	191
Machinery and machs., NOS	+3.9	-18.4	Neg.	-1.5	-7.1	Neg.	-2.8	-5.6	Neg.	246
Automobiles, passenger	+6.1	-21.3	Pos.	-2.5	+24.6	Neg.	-0.8	+62.5	Pos.	187
Vehicle parts, NOS	+6.2	-23.3	Neg.	-1.4	+25.4	Pos.	-0.7	+5.1	Pos.	195
Cement: natural and portland	-1.9	-1.8	Neg.	-7.8	-5.4	Neg.	-10.5	-27.0	Neg.	142
Lime, NOS	+4.8	-8.6	Pos.	-3.1	+6.7	Neg.	-2.4	-9.4	Neg.	142
Scrap paper and rags	-1.5	-5.1	Neg.	-10.0	+9.3	Neg.	-3.4	-9.7	Neg.	120
Printing paper, NOS	+0.8	-0.2	Pos.	-4.9	+3.5	Neg.	-3.4	+4.8	Neg.	159
Paperbd., fibrebd., pulpbd.	+0.9	-0.8	Neg.	-2.7	+14.0	Neg.	-1.9	+0.8	Neg.	168
Wallboard	+0.9	+11.0	Pos.	-5.1	+11.3	Neg.	-0.9	-13.6	Neg.	165
Glass bottles, jars, pkg. glass, NOS	+5.6	-11.7	Neg.	-0.8	+7.9	Pos.	-0.8	-14.7	Neg.	138
Refrig., freezing apparatus	+3.9	+0.3	Neg.	+0.7	+22.9	Neg.	-1.5	-9.3	Pos.	150
Furniture, NOS	+5.5	-3.4	Neg.	-6.7	+6.1	Neg.	-1.6	-8.1	Neg.	141

(continued)

TABLE 1 (concluded)

	1957-58			1958-59			1959-60			
	A	B	C	A	B	C	A	B	C	D
Liquors, malt	-0.9	+0.1	Neg.	-3.6	-2.8	Neg.	-2.8	-2.6	Neg.	118
Sugar	0.0	+5.0	Neg.	-6.7	-3.7	Neg.	-7.2	+7.0	Pos.	160
Food prod., NOS, in cans and pkgs.	0.0	+0.9	Neg.	-3.6	-1.2	Neg.	-1.9	+2.3	Neg.	127
Feed, animal and poultry, NOS	0.0	+3.4	Pos.	-2.3	-4.1	Neg.	-3.2	-6.4	Neg.	79
Containers, metal	+6.8	-5.3	Neg.	-0.7	+3.6	Neg.	-1.4	-13.8	Neg.	144
Containers, fibrebd. and paperbd., Knocked down	+2.3	-9.1	Neg.	-1.5	-1.4	Neg.	-2.3	-8.8	Neg.	141
Scrap iron and scrap steel	+8.2	-30.5	Neg.	-2.3	+28.9	Pos.	-1.6	-8.6	Neg.	161
Furnace slag	+2.6	-8.8	Pos.	-6.7	-5.2	Neg.	-0.9	-13.6	Neg.	76
Waste materials, NOS	+6.2	-12.4	Neg.	-5.1	+16.1	Neg.	-4.6	-8.8	Neg.	110
Manufacturers and misc. NOS.	+3.4	-5.1	Neg.	-7.4	+14.1	Pos.	-2.7	+3.5	Neg.	120

A = Per cent change in rate index.
B = Per cent change in revenue.
C = Direction of revenue change after adjustment for market size.
D = Revenue-cost ratio.

Source: A. *Indexes of Average Freight Rates*
B. *Fluctuations in Railroad Freight Traffic.*
C. Derived from data in sources indicated under (A), (B), and (D).
D. I.C.C. Bureau of Accounts, *Distribution of Rail Revenue Contribution by Commodity Group . . . 1960* (Stmt. 2-62).

[a] Single deck, i.e. shipments in single-deck rather than double-deck stock cars.

The strong inference from the table is that railroad pricing actions have indeed been singularly unfruitful. Only in scattered cases has a decline in the rate index been associated with an increase in the revenue attained from a particular class of traffic when change in market size is taken into account.

The direction of the revenue increment is a reflection of the effectiveness of railroad pricing policy in the face of the strategy or any "inherent" market advantages of their competitors. A closer look reveals the strength with which other market forces have actually counteracted increases in market size, as well as the potential traffic-stimulating effect of most rate reductions. In a number of extreme cases, in fact, large increases in market size were so completely counteracted that the volume after the price decrease was less than in the initial period.

In the 1959–60 period, thirty-five rate reductions were accompanied by a market expansion. Despite this favorable market trend, tonnage increases occurred in only fifteen cases, eight of which increased more slowly than the market enlargement. The rate reductions induced an output expansion beyond what would have been expected from increased market size in only seven (or one-fifth) of the cases. But in an even more extreme instance, twenty of the thirty-five price reductions were associated with an absolute decline in tonnage carried, perversely suggesting a positively sloping demand function and indicating the power of the forces eroding the railroad's market position.

The strength of these antirailroad forces can be roughly measured by relating the increased output expectable from the market expansion to the actual tonnage contractions. The sum of the potential revenue increment attributable to market growth, plus the decline actually realized, provides a rough absolute measure of the contributing influences in the twenty cases. Dividing this sum by the first amount reduces this measure to relative terms and produces a "revenue shrinkage ratio" based on the values derived from the factoring processes previously described (footnote 34). A ratio of one denotes a complete offset of the increased market potential, while a higher ratio indicates an even greater revenue depression. A ratio of two, for example, means that the counteracting forces depleted revenues by double the expansion dictated by the enlarged market, despite the reduced prices. The "shrinkage ratios" thus derived for 1959–60 generally range up to nearly seven, with a further jump to seventeen. Extremely powerful adverse market forces are clearly at work here.

The relationship of rate policy to prevailing revenue/out-of-pocket ratios is also of interest (see Table 1). Most surprising is the rather

large number of cases where reductions occurred in the face of ratios below 100, which was true of ten of the fifty-five downward adjustments in the 1959–60 period. Although the revisions were generally nominal, they ranged on occasion up to 7 per cent. Unless rather sharply declining variable costs are anticipated, the rationale for these price changes is most obscure. On the other hand, a number of the reductions were associated with ratios well above the 129 all-commodity average, including twenty-nine of the fifty-five recorded in the 1959–60 period. This suggests that cost considerations frequently did not impose tight limits on the reported rate decreases.

While the data are too sparse and too generalized to permit any real diagnosis or prescriptions, several tentative conclusions are suggested by the foregoing discussion. It is evident that, in general, railroad price reductions have not thus far contributed to profitability in *absolute* terms. It is possible, of course, that market reactions are sticky and that any positive benefits from rate cuts will emerge only over a longer time period than was observed here. This effect, however, does not show up in the data studied. In any case, it is apparent from the demand shifts that railroad pricing policy faces extreme difficulties (including possibly an inexorable trend away from rail transportation), substantial price insensitivity of much traffic, or the rather consistent ability of competitors to outmaneuver the railroads in pricing actions. Price reductions of the kind reviewed clearly offer no panacea for dealing with the industry's financial ills.

While commonly unprofitable in a positive way, it is obviously possible that reduced rates may still yield larger revenues than higher ones. Although judgments about such relative profitability are extremely cloudy because of the lack of information about the course of nonrail rates and other vital factors, some of the cited evidence is relevant. The observed limitation on tonnage and revenue expansion, imposed by the contrary market forces, must stem from either inelastic demand, unfavorable demand shifts, or both. To the extent that inelastic demand is the cause, the reductions are certainly a mistake. Demand shifts are clearly an important factor unless the anomaly of positively sloping demand functions is accepted. Some additional clues to the relative profitability of reductions are thus afforded by a consideration of the character and basis of these shifts. If, in particular, they are due to changes in the prices of substitutes, a vital question is whether these price movements were induced by or occasioned the railroad rate reductions. Although it is impossible to generalize about the antecedents of the price changes examined here, the railroads are

commonly regarded as the price leaders. Where they did start the action (and the changed price relationships are the cause of the demand shift), they would have been better off to maintain the *status quo*. In this situation the absolute unprofitability of a reduction also spells relative unprofitability. In other words, rate reductions are not generally profitable even in these relative terms where there is a reasonable chance of maintaining market shares with rate stability.

It is probable, however, that much of the unfavorable shift in demand is due to forces other than price relationships, or to a continued change in the transportation service requirements of the economy. In this case, no generalizations regarding the relative profitability of price reductions can be drawn from the available data. But it seems likely that decreases may be the appropriate response in such a situation. It is noteworthy, however, that in the cases observed price policy has not generally coped effectively with demand changes. It may be significant that these price changes have been rather modest. Many, furthermore, were associated with relatively high revenue-cost ratios, offering an opportunity to counter both such adverse market forces and competitive price responses. This suggests that in some cases at least reductions should possibly be far bolder than they appear to be from this sample. The potential expansivity of the traffic involved is indicated by the very low rail market shares that characterize these commodities, all running below, and most far below, 50 per cent.[35]

Regardless of other lessons that this discussion might offer, it seems clear that fully effective railroad pricing policy under present adverse conditions undoubtedly requires far greater insights into market behavior than are presently available. A great deal of attention has been devoted to the cost (or supply) side of transportation markets. Certainly the same intensive effort is required on the demand side.

Transport Costs and Discrimination Control

The pricing system obtained by maximizing net revenues in particular markets is, of course, highly discriminatory. When unallocable costs find their way into prices through differentiated demand functions, there will generally be an inequality of $P - MC$ relationships. However, the system does improve utilization of railway plant that is fixed

[35] Bureau of Transport Economics and Statistics, *Fluctuations in Railroad Freight Traffic Compared with Production, Class I Line-Haul Railroads, 1958, 1959, and 1960* (Statement No. 6301, 1963).

over relatively long time periods, and permits a reasonable degree of managerial discretion in responding to market forces. In this process some prices will be set below average costs at the prevailing output level, creating "downward discrimination." Others will rise above this measure where demand elasticities permit.

In theory, shippers paying below-average and above-average rates benefit along with the transportation companies from these price relationships. The gain to the shippers from the downward discrimination is apparent, while transport companies ostensibly benefit from the greater utilization and lower average costs induced by the relatively low charges. But completely happy results are not assured from the workings of this pricing system. To the extent that transport rates depart differentially from costs, uneconomic patterns of resource use are encouraged in the nontransport sectors of the economy. Furthermore, it is not necessarily true that the shippers paying rates reflecting upward discrimination are better off.[36] In other words, in the abstract at least, some form of discrimination control is indicated to limit the unfavorable effect on the nontransport sector of the economy and to insure that the rates assessed in the highly inelastic markets do not injure rather than benefit the affected shippers.

In this context, low rates are justified only if they contribute more than higher rates to the support of the system and thus diminish the financial burden on other traffic. The basic social justification for discrimination requires, therefore, that the high rates are less than they would be with nondiscriminatory charges. Accordingly, higher than average rates are unjustified if they exceed amounts dictated by the output and unit cost that would be associated with rates represented by uniform relations with marginal costs.[37] To illustrate, assume output (sales) of 50,000 units under discrimination but only 30,000 under uniform pricing, with unit costs of 2.0 and 2.3 cents respectively. In this case, shippers paying more than 2.3 cents would be better off without discrimination; such rates thus assess an unjustified burden of support which violates the basic social rationale of this pricing system. This test contrasts sharply with the present comparative

[36] Others have, of course, pointed this out. See, for example, Merton Miller, "Decreasing Average Cost and the Theory of Railway Rates," *Southern Economic Journal*, Vol. 21, p. 39.

[37] Since different services are not homogeneous but incur varying direct or out-of-pocket costs, discrimination is not eliminated by uniform rates per unit of output, but by a uniform ratio between rates and out-of-pocket costs. In the following discussion, this is the meaning attached to the removal of discrimination and to references to "uniform pricing."

system which, devoid of external or objective measurements, circularly permits one high rate to justify another.

It would be strictly an academic exericse to labor the question of rate ceilings if the present degree of transport competition insures that economic limits of rates are not exceeded. But it is apparent that substitution elasticity varies widely among transport markets, depending on such factors as haul distance and commodity characteristics. Furthermore, the substitutional impact of one major alternative, barge transportation, is rather restricted geographically. It is possible, therefore, that residual monopoly powers (or even regulatory rate floors) may permit degrees of discrimination that exceed socially acceptable standards. Meyer and his associates conclude from their analysis of the demand characteristics of transportation that they "do not set an effective ceiling on the rates of non-competing traffic at a level that precludes monopoly profits." [38]

Although not providing evidence regarding its economic legitimacy, the I.C.C.'s revenue contribution studies describe the sweep of discrimination in rail rates through revenue/out-of-pocket cost ratios for the different territorial movements of the various commodity classes. Table 2 shows the 1960 distribution of ton-miles by revenue-cost ratios which exceed that year's average of 129. The ratios rise to relatively high levels, ranging to over 500 per cent of out-of-pocket costs. Significant traffic volumes are involved, with nearly 17 per cent of 1960 traffic bearing rates representing revenue-cost ratios over 170. There may be some basis for suspecting that rates in these extreme reaches of discrimination are unduly high. If so, it is worthwhile to indulge in some speculations regarding the reasonableness of these rates in terms of the cost-oriented uniform pricing test that was previously advanced.

Cost studies of the Commission's staff indicate that, at generally prevailing traffic densities, costs are about 70 per cent variable and 30 per cent fixed in the "long run." The actual behavior of the out-of-pocket or variable portion of total costs is conjectural, but the cost studies indicate that these outlays are unchanged per unit as volume changes. This behavior will be adopted as a simplifying assumption in this analysis. Based on these cost functions, it is possible to measure the inflation in unit costs from a given percentage decline in traffic and the resulting percentage increase in the average rate level that would be required to meet all costs, including present overhead coverage. For example, if uniform pricing occasioned a 40 per cent traffic reduction,

[38] Meyer *et al.*, *Economics of Competition*, pp. 201–202.

fixed costs would increase by 100 per cent but total unit costs by only 20 per cent. To cover this increase and maintain the same total revenue contribution, rates would have to be set for all traffic at 155 per cent of out-of-pocket costs (where 1960 was 129).

The indicated traffic and revenue effect of uniform pricing at any given ratio of out-of-pocket costs depends upon the price elasticity of rail transport demand in particular markets, and upon the distribution of total traffic volume in terms of revenue-cost ratios. The latter factor is associated with the former since it determines the percentage changes in price (both increases and decreases) which would be involved in moving to uniformity at a given level. For example, output would be less seriously affected by the shift to uniformity if there are substantial blocks of traffic, moving at relatively high rates, which would be benefited by the contemplated reduction (representing the effect of traffic distribution). This would be particularly true if the reductions occasioned sharp increases in the movements of these commodities (representing the elasticity effect). On the other hand, large volumes at lower rate levels, with heavy price increases, would enhance the output reduction, particularly if the associated demands are highly elastic.

Traffic distribution is available from the Interstate Commerce Commission's 1 per cent waybill sample, and the rate-cost ratios from the revenue-contribution studies. But since the elasticities are subject to conjecture at this stage of transport market analysis, it is impossible to assess accurately the traffic effects of uniform pricing, or to determine the uniform level of rates which would permit full overhead coverage. Some general indications may be provided, however, by testing the possibility of achieving a traffic level 60 per cent of the present level, with rates uniformly set at 155 per cent of out-of-pocket cost. This is the level that would be required for full overhead coverage, if costs are 70 per cent variable.

On the surface, at least, it appears that the prospects of retaining the required portion of present output with such prices are not at all remote. According to the I.C.C. waybill data, nearly one billion ton-miles (or about one-quarter of the sample total), entail rates exceeding the indicated level.[39] This traffic nucleus by itself represents nearly half of the required output, and a reduction in these relatively high rates (ranging to over 500 per cent) to a level 155 per cent of out-of-pocket

[39] Computed from data in I.C.C., Bureau of Transport Economics and Statistics, *Territorial Traffic and Revenue by Commodity Classes*, Carload Waybill Statistics, 1960, Statement TD-1; and, *Distribution of Rail Revenue Contribution by Commodity Groups, 1960*, Statement 2-62.

TABLE 2

DISTRIBUTION OF TON MILES BY REVENUE COST RATIOS, 1960
(based on 1 per cent waybill sample)

Revenue-Cost Ratio Classes	Total Ton-Miles	Per Cent	Cumulative Per Cent
130-149	745,727,000	17.183	17.183
150-169	453,546,000	10.450	27.633
170-199	359,050,000	8.273	34.906
200-249	347,974,000	8.018	43.924
250-299	27,856,000	0.641	44.565
300-349	1,982,000	0.045	44.610
350-399	763,000	0.017	44.627
400-449	998,000	0.022	44.649
450-499	224,000	0.005	44.654
500 and over	1,686,000	0.038	44.692

Source: Revenue-cost ratios from I.C.C., Bureau of Accounts, *Distribution of the Rail Revenue Contribution by Commodity Groups ... 1960* (Statement No. 2-62, 1962). Ton miles from I.C.C., Bureau of Transport Economics and Statistics, *Territorial Distribution Traffic and Revenue by Commodity Classes*, Carload Waybill Statistics, 1960 (Statement TD-1, Supplement, 1961).

costs should occasion a significant expansion in this volume. The transport demands for many of these commodities were undoubtedly quite inelastic when the high-rate patterns were established in the days of extensive railroad monopoly. They are undoubtedly more elastic now in view of the heavy inroads that have been made by competitive transportation. Rate reductions of the order premised here, therefore, would probably stimulate much additional volume.

The potential expansibility of this sector is indicated by the fact that during 1960 the railroads handled an over-all average of only about one-quarter of the total tonnage movement of the commodities involved.[40] The hypothetical level of rates should be competitively attractive in tapping the huge balance in this traffic reservoir; rates at 155 per cent of out-of-pocket costs would, in 1960, have averaged only 2.5 cents per ton-mile—well below the regulated average cost for trucking. It seems reasonable to conclude that most of the output required to sustain present overhead coverage (60 per cent of existing volume) would be realized from traffic now moving at ratios exceeding the 155 ratio.

Furthermore, a substantial volume of traffic moving at ratios less than 155 could probably be retained. This would particularly be true in the sector involving ratios between 130 and 155 where rates are above

[40] Computed from data in *Fluctuations in Railroad Freight Traffic.*

average. In the waybill sample, this sector included 800 million ton-miles, another fifth of the total. Assuming this volume to be evenly distributed within the indicated ratio limits, the resulting average rate advance amounts to only 10 per cent. Many of the transportation demands associated with these above-average rates would probably be somewhat inelastic, indicating that rate increases would occasion a less than proportionate volume reduction from the rate advance premised. But even if unitary elasticity is assumed, most of this traffic could be retained, along with the expanded assured amount in the ratio sector over 155. Finally, although the demands are in many cases highly elastic, some of the vast volume moving at ratios less than 130 would continue to move at higher rates.

Although far from conclusive, the foregoing considerations at least suggest that a uniformly established rate ratio of 155 could sustain the level of traffic volume required to support present overhead coverage. But even if it should fall a little short, so that average cost (including overhead) would rise somewhat above the level associated with the 155 ratio, these considerations call into serious question the present rates which are at levels substantially exceeding this ratio. This would certainly appear to be true of rates exceeding double out-of-pocket costs.

The foregoing arguments should not be construed as advocating cost-based pricing with uniform overhead contributions. The possible effect of this system was considered only in order to visualize its implications for volume, average costs, and appropriate discrimination limits. Discrimination is still a valid railroad pricing device, but its range may quite possibly be excessive in terms of the cost structures associated with present-day traffic densities. Any rates that exceed a ceiling indicated by the test described here are questionable since the shippers involved are worse and not better off with discrimination. Assuming, however, that the lower rates make their best contribution to overhead, neither public or private purposes would be served by arbitrarily increasing them to some stipulated ratio. Discrimination below the ceiling facilitates overhead coverage and reduces average costs and over-all rate levels, thus truly benefitting those paying above-average rates. But to confine discrimination within the stipulated limits would minimize the distortions associated with uneconomic patterns of resource use. In short, discrimination thus restricted would be both more equitable and more economic.

The reduction of excessively high rates may imply a revenue gap and less complete overhead coverage, but this is by no means certain. It is

more than possible that many of the offending rates are not only excessive by the standards advanced but are uneconomically high in terms of maximizing overhead coverage. Furthermore, any realistic system of discrimination control should insure that rates at the other end of the axis are not uneconomically low in terms of their revenue contribution potential. The large number of movements failing to cover the Commission's measure of out-of-pocket costs aggregated a deficit of $243 million in 1960.[41] The mere elimination of these deficits (e.g., by dropping the traffic) would enhance overhead coverage by nearly 15 per cent. It is likely that much of the traffic involved would, if appropriately priced, make a positive contribution. Furthermore, there must be an interesting volume which does not produce deficits but which is favored by rates which are still uneconomically low.

It is possible, however, that further restraints on upward discrimination might restrict over-all earnings and prevent overhead coverage. Such restrictions are certainly not inconsistent with present regulatory policy since the rate structure is honeycombed with maximum rate orders, at least some of which must be of more than token significance. But the desirability of tighter discrimination limits represents a transport policy problem of some magnitude.

From one viewpoint, there is no apparent reason for "monopoly" traffic *as a class* to contribute significantly more to the financial support of the system than does competitive traffic under a system of regulation which is designed to restrict rates to "reasonable" levels. It is precisely in the competitive sector of the economy that, by definition, a "normal" return is earned. In other words, where competition is at work, the market determines financial rewards and investment returns. Fair competition does not generally provide undue restraints on earnings and there is no reason to expect it to do so in transportation, particularly with the usual regulatory limits on the pressures of price competition. If a normal return is appropriately construed as that accorded under competition, there is no reason to have to "make up" anything on that portion of a company's business that is not subject to competitive pressures. If realizable returns are not adequate, in the face of competition, to induce and support additional investment, it should not be made; certainly it should not require the support of monopoly returns in noncompetitive markets.

On the other hand, hewing too closely to the line of more rigorous discrimination control and thus curtailing profit opportunities in the

[41] *Distribution of Rail Revenue Contribution by Commodity Groups—1960*, p. 22.

railroad industry may have an adverse effect on innovation and other socially desirable elements of progress. If investment beyond that dictated by competitive market forces (either actual or as simulated by regulation) are regarded as desirable, the available alternatives are, apparently, to subsidize the railroads or permit them to tap markets for all they can get. There are strong arguments for subsidy since the cost of social objectives can thus be born by the economy as a whole rather than by a limited number of consumers and producers or ecomonic sectors.

If the subsidy approach is neither feasible nor palatable, and earnings in excess of competitive allowances are indeed required, recourse to highly discriminatory rates is indicated. In this case, the elimination of present maximum rate controls may be called for. If, on the other hand, it is regarded as desirable to limit discrimination in order to strike a more judicious balance between its advantages and its costs, a close look at governing standards and other criteria is required. Although such control has been one of the important functions of regulation, it is questionable whether the historic concepts and methods are adequate to maximize the gains and minimize the costs of discrimination. The comparative method of testing rates was perhaps adequate in earlier years when the forms and procedures of regulation were developed. In the era of lower traffic densities, the legitimate sweep of discrimination was much broader than at present, and the opportunity for developing refined tests was limited by the relative crudity of the available analytical techniques and machines. Although perhaps formerly necessary and adequate, the comparative method under which one high rate justifies another is plagued with circularity and provides no standards of any real vitality and validity.

As the need has changed, analytical methods and opportunities have improved immeasurably. But rational data exploitation is impossible without a comparable improvement in the concepts of rate control. If maximum rate control is to be continued, the feasibility of employing the "uniform pricing" test suggested here should be explored.

Conclusions: Concepts and Their Operationality

In this paper I have argued for the conceptual validity of transport rates related to incremental rather than to "full" costs; rates geared to demand conditions rather than to cost allocation formulas. According to this argument, "market-oriented" rates pass muster reasonably well in terms of significant economic criteria. Specifically, they are not

inimicable to viable investment levels or to interagency traffic allocations consistent with efficient distribution patterns. Stated more positively, rates not fettered by regulatory ties to full-cost criteria can produce economic results as satisfactory as those realized from the operation of the price system in the economy generally. Commission regulation, however, is prone to distrust these results and to stifle market forces in key cases by inappropriately gearing competitive rates to fully distributed costs.

But the virtues of the market-oriented prices depend on the quality of the performance of both regulation and private management. Regulation must guard against any excessive discrimination that might arise from the pursuit of maximum profits in separate markets. Effective performance of this function requires far more refined and sophisticated tests—including both concepts and measurements—than have been applied in the past. Costly inefficiencies can also creep into "market-oriented" prices from the private (management) side. Clearly some modification of the historic monopoly-based "value-of-service" rates are in order. But gratuitous rate reductions that do not improve net revenues (and that are not required to realign rates exceeding the acceptable limits of discrimination) undermine the financial integrity of the transport system, impair investment adequacy, and create inefficient long-run traffic allocations. On the other hand, undue pricing conservatism, particularly on the part of the railroads, may produce the same results.

Unfortunately, the right path is not clearly marked. The zeal for "cost-finding," important as it is, digs up only part of the answer; cost measures tell only the scope of rate reductions that is tolerable, not what is socially efficient or privately desirable. All of the ordinary complexities of oligopolistic (and, with the rate bureaus, duopolistic) price behavior are compounded by the intricate interrelationships of transport costs, rates and total distribution systems. As shippers perceive and measure these interrelationships with greater refinement, distribution requirements become the key to transport demand. It seems to be a safe assertion that despite all of the complexities, far more is known about the measurement of transport costs than of demand. It is questionable, indeed, whether the problem of demand measurement has even been fully conceptualized in the specialized context of transportation since commodity value lost its meaning.

The need for greater understanding of demand, and of transport markets generally, is urgent for both pricing and its regulation. This can be accomplished only by broad-scale research efforts in this sector

of the economy. Only through the improved insights thus afforded will there be a reasonable expectation that transport prices—with or without regulation—will produce tolerably efficient allocations.

COMMENT

JAMES W. MCKIE, Vanderbilt University

This paper confirms again what has often been remarked about the comparative-statics approach to the theory of cost: the inadequacy of the long-run cost curve of the firm as a tool of economic analysis. Its inadequacies are not in logic but in application. In public utility economics, much more than in analysis of competitive firms, the long-run cost curve repeatedly fails to tell us what we want to know about long-run costs. It almost always turns out that some functional relationship other than the classic one is the one that counts. The classic relationship is that between simple volume, moving in an unchanging grid of time and space, and average cost with all factors fully variable. In railroad economics, the volume measure for such a concept, as Nelson points out elsewhere in this volume, is density of use per mile of railroad. Yet the dimensions of a real problem for decision may include this one only secondarily, if at all, and usually turns on some other—on geographical extensions or cross-connections, secondary systems, bottlenecks, different bases of service, central-station balance in different distributive configurations, or load-factor problems of one kind and another. These produce cost relationships that are hybrids of long- and short-run elements, reflecting several output dimensions and often containing some effects of technological change. These essentially nonreversible cost functions, rather than the classic envelope cost curve, are the ones that are relevant to the problems that have actually arisen.

What confronts us now is a problem of transition—from monopoly toward competition, and from value-of-service pricing toward cost-of-service pricing in transportation. But, because the railroads still have prodigious economies of scale, indivisibilities, and inflexibilities, they cannot simply be fitted into the new pattern like a small piece into a mosaic. Though their size and scope will be reduced compared with what they were in the days of monopoly, they cannot simply be squeezed down to the appropriate size along the same path they followed when they were expanding. The railroads can be squeezed right out of existence while we are still trying to find what their ultimate role will be

in that transportation equilibrium that we have had so much difficulty in visualizing. If the railroads do survive, some indivisibilities must remain, and no doubt some value-of-service prices will remain along with them.

Professor Roberts asks the right questions: what will be the size of the railroad system in equilibrium, when all agencies of transport have finally been fitted into the optimum pattern? And will the costs, the rate structure, and volume of traffic appropriate to that equilibrium permit the railroads to survive and prosper? One might suggest additional considerations for the answers. Some kinds of service, and some of the costs associated with them, can be eliminated without affecting the cost-density relationship on trunk lines. Roberts himself notes that dropping the traffic which fails to cover out-of-pocket costs would itself enhance overhead coverage. Some of this traffic would still move at higher rates. Such measures as dropping passenger traffic, or at least handing over commuter services to some welfare agency, would greatly reduce losses without appreciably affecting unit costs on the remaining traffic. The abandonment of spur lines, backwater traffic, and lightly used branches might do likewise without necessarily affecting the density of traffic on main lines, since much traffic is shifting its locus with the increasing geographic polarization of population and economic activity. Where spur lines or weak branch systems are thickly grafted onto a trunk line which would otherwise be strong, some means must be found for lessening the load of debt and capital claims left behind when such unecomonic facilities are abandoned. It seems to me that this would be a most fruitful way to use government financial help, since the only other way to reduce the burden of claims in line with a reduced plant is through bankruptcy and reorganization.

Turning now to the question of rate structure, a consensus seems to be emerging among economists who have recently been studying the problem of interagency competition. It is roughly as follows: (1) Short-run fully allocated (average) costs are not an appropriate basis of pricing for railroads. (2) The appropriate minimum standard of price for railroads is long-run marginal cost. (3) This is also an appropriate minimum standard for other transport agencies, but because of their particular cost relationships, long-run marginal cost will be very close to short-run average cost (for all except pipelines—a special case with a decisive advantage in one commodity). (4) Hence, a rational allocation of freight traffic (excepting pipelines) among competing agencies will be achieved if prices are equal to minimum short-run average costs including a competitive profit for motor trucking and water transport. Railroad rates would depend on the cost-plus-service-advantage of

competing agencies for the traffic in question, but the railroad's long-run marginal cost would be a minimum. This much of value-of-service pricing would remain in the equilibrium of transport rates. Of course, the railroads might well be priced out of the market for short hauls, or where speed of delivery is either very important or so unimportant that the waterways' advantages in bulk transport will tell.

But what is this long-run marginal cost that is to be the minimum for railroad rates? Not the same marginal cost that the railroads could look forward to if they were building their entire plant *de novo*. It is, instead, one of those hybrid concepts. If we take the present plant and shake out the uneconomic parts of it mentioned earlier, the long-run marginal cost is the incremental cost of equipment and long-run maintenance, plus the variable-factor cost, associated with increases in the volume of traffic in the neighborhood of the volume that will move when priced competitively as suggested. Rates equaling or exceeding this "LMC" are economic. It should not be hard to find a reasonably correct measure of this minimum. It is clearly lower than fully allocated short-run average costs for the railroads.

The concept of nontransport distribution cost (NTC) suggested by Roberts is a useful measure of "service advantage." The rule contemplated is that the railroad should be permitted to capture any traffic from other carriers if its LMC, as defined above, plus its NTC is less than their minimum SAC plus their NTC for the traffic. The rail rate may be brought as low as necessary to accomplish this result, provided it exceeds LMC. Since most types of traffic are diverted from competing carriers only by degrees, this rule for the railroad would amount virtually to value-of-service pricing above LMC, adjusted to the new competitive circumstances which have greatly increased demand elasticity for most railroad transportation services.

If this interpretation of the consensus is correct, it also means that the regulatory authority should not use short-run average cost as a minimum standard for rail rates, but it would be justified in preventing cuts below rail LMC down to short-run out-of-pocket cost or below it. Many critics believe, however, that the antitrust laws, rather than rigid rate regulation, are the best weapon against "predatory" pricing by railroads, and that the regulatory authority often insists on a "fair" division of traffic and preservation of competing vested interests when wholly unjustified by the underlying economic relationships.

What would the suggested principles of rate-making do to the present allocation of traffic? What would the equilibrium allocation be, under projected cost conditions? We do not know nearly as much about this

as we should, considering that we need to predict whether the railroads could survive under those circumstances and whether massive reallocations and shrinkages in capacity of other agencies of transport might be necessary during the transition. The indivisibilities and economies of scale of the railroad are good reasons for our special solicitude for its traffic volume, to say nothing of its remaining position as the sole available carrier for some types of freight movement. It is much easier to effect a shrinkage in truck or waterway capacity without strong effects on unit costs. If such shrinkage were indicated, ways could be found to ease the transition for those carriers. (It is probably too much to hope in addition for imposition of full user charges and a cessation of uneconomic waterway development.)

Many of the estimates of minimum railroad freight volume under flexible pricing that I have seen seem to be on the low side. Some of these estimates are based on inferences from simple commodity characteristics rather than on calculations of cost and transportation demand. Roberts' own calculations are not designed to answer this question, but to show what might happen under strict cost-of-service pricing. We can take this as a minimum estimate or most pessimistic limit of the railroads' share in the total transport volume, assuming uniform rates. If the rules indicated above were followed instead, traffic for the railroads would very likely increase markedly instead of diminishing. Recent experience suggests that more rational pricing may recapture large volumes of remunerative traffic. One can refer to the multiple-car rates for coal, or the reduced grain rates which have elicited cries of unfair competition from the waterway carriers in the South. Minimum-volume rates and all-commodity rates are also promising, and the lower rates for automobiles combined with technological innovations in automobile carriage have apparently been successful. Rail-truck piggyback service may decisively reduce the railroad handicap of high terminal costs and slow service on package freight and manufactured goods, for all except very short hauls. In spite of Roberts' unfavorable findings on past experience with railroad rate reductions, the general picture of prices and demand elasticities at present leads me to believe that a massive and comprehensive reform of transport price policy would not only increase the rails' share of traffic but also have a strongly favorable effect on their revenues. But I agree with Nelson that these reorganizations, abandonments, rejuvenations and pricing reforms must be put into effect without delay; else the momentum of decline for the railroads may become too strong to reverse, short of government receivership.

HOWARD W. NICHOLSON, Clark University

Roberts' paper deals with controversial issues of minimum and maximum rate regulation. He stresses the desirability of permitting railroads to lower rates to incremental costs, by which he means costs incurred in producing additional units of service. Roberts states that he is interested in allocative efficiency and he argues that, in view of the existence of large fixed costs, maximum use of the rail system can be encouraged by discriminatory rate policies, that is, by stressing demand factors in the determination of rates. Despite evidence which he has collected which suggests that rate cuts may prove to be disappointing in increasing profits, Roberts appears to be relatively hopeful that the elasticity of demand for rail service will be high when cuts of sufficient size are undertaken. He also seems optimistic about the success of aggressive discriminatory pricing policies in contributing to the revenue needs of the railroads. The contrast between the views of Nelson and Roberts in this regard is striking, and it is a matter of considerable importance as to which position is correct. This subject deserves more careful examination.

Important as it is, the question of the effectiveness of rail-rate reductions in attracting additional revenue to the railroads is but part of the current problem of transportation pricing policy, and concern with railroad rate-making has tended to obscure more fundamental pricing questions. Complete analysis of transport pricing policy should involve consideration of the implications of pricing arrangements for: 1. investment in transport facilities, 2. use of existing facilities, and 3. the cost and quality of transportation service.

Although Roberts flirts with cost considerations and occasionally alludes to the relevance of price-cost considerations for investment decisions and industrial location, his paper creates the impression that he is primarily interested in rate-making practices that will encourage fuller utilization of existing railroad plant. He does not seem to be vitally concerned with the implications of pricing from the standpoint of the long-run problem of encouraging efficient investment in transport facilities, nor does he seem to attach much significance to development of transport rate structures which will encourage a more rational pattern of industrial location. The essential difference between Roberts and those—like myself—who advocate the development of rate policies in which rates are encouraged to bear a reasonable relationship to long-run marginal costs is that the disputants are concerned with different aspects of the total problem of transport pricing policy.

Roberts deserves credit for emphasizing, as he has done, the danger that emphasis on costs in transportation rates may in practice produce policies that tend to keep rates too high. I agree that policy does better to err somewhat on the side of encouraging flexibility in rate-making. But I regard as either wrongheaded or shortsighted economists who push transport investment problems under the rug and assume that by disregarding the problems of fixed costs in rate-making and letting nature take its course, somehow problems of resource allocation in transportation investment and problems of industrial location will be smoothly resolved. Is it not paradoxical that the competition that has developed in transportation and upon which we economists have come to depend for rationalization of domestic transportation affairs, is in fact a competition for railroads from transportation agencies which derive very large amounts of fixed capital from government sources. A crucial issue for modern transport pricing policy and one to which Roberts' analysis does not give sufficient weight is that of investment policy and the relationship which transport pricing bears to investment flows into the transportation system as a whole.